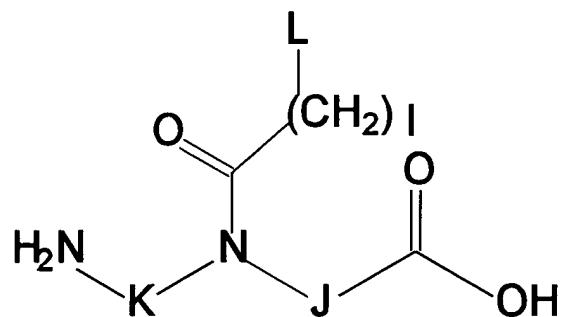


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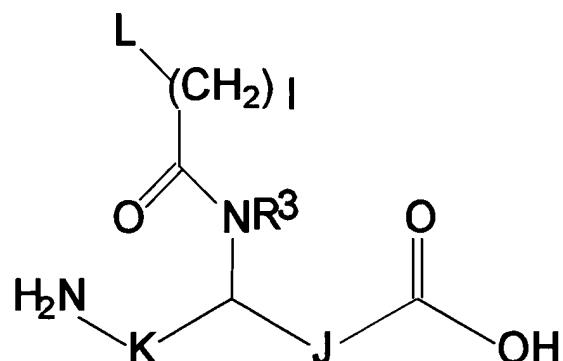
RESPONSE UNDER 37 CFR 1.116
EXPEDITED PROCEDURE
EXAMINING GROUP 1634

Please amend claims 30 and 38 as indicated below:

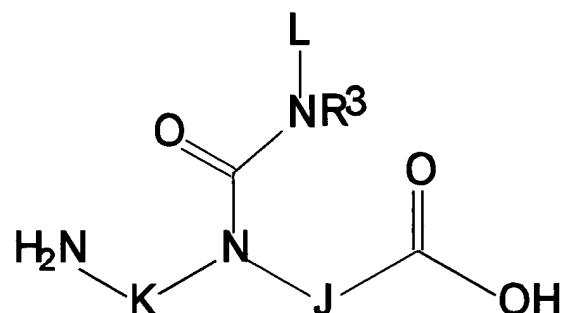
30. (Twice amended) A peptide nucleic acid conjugate comprising a plurality of PNA monomers wherein at least one of said PNA monomers has the formula:



or formula:



or formula:



wherein:

L is $R^{12}(R^{13})_a$; wherein:

R^{12} is hydrogen, hydroxy, (C_1-C_4) alkanoyl, a naturally occurring nucleobase, a non-naturally occurring nucleobase, an aromatic moiety, a DNA intercalator, a nucleobase-binding group, a heterocyclic moiety, a reporter ligand, or a conjugate and at least one of R^{12} is a naturally occurring nucleobase, a non-naturally occurring nucleobase, a DNA intercalator, or a nucleobase-binding group;

R^{13} is a conjugate; and

a is 0 or 1;

K is $(CR^6R^7)_z$;

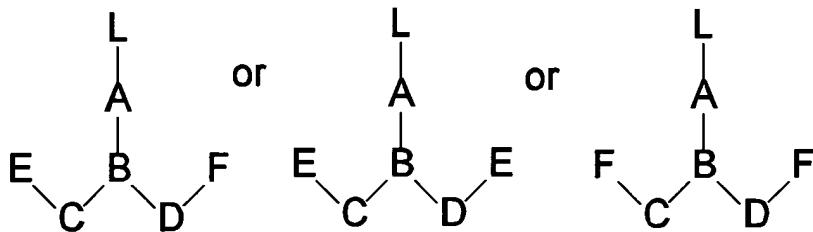
J is $(CR^6R^7)_y$; wherein:

R^6 and R^7 are independently hydrogen, a side chain of a naturally occurring alpha amino acid, (C_2-C_6) alkyl, aryl, aralkyl, heteroaryl, hydroxy, (C_1-C_6) alkoxy, (C_1-C_6) alkylthio, a conjugate, NR^3R^4 and SR^5 or R^6 and R^7 taken together complete an alicyclic or heterocyclic system;

R^3 and R^4 independently are hydrogen, a conjugate, (C_1-C_4) alkyl, hydroxy- or alkoxy- or alkylthio-substituted (C_1-C_4) alkyl, hydroxy, alkoxy, alkylthio or amino;

R^5 is hydrogen, a conjugate, (C_1-C_6) alkyl, hydroxy-, alkoxy-, or alkylthio- substituted (C_1-C_6) alkyl; each of y and z is zero or an integer from 1 to 10, the sum y + z being greater than 2 but not more than 10; l is an integer from 1 to 5; and at least one of L and R3 comprises a conjugate selected from a reporter enzyme, a reporter molecule, a steroid, a carbohydrate, a terpene, a peptide, a protein, a phospholipid, a cell receptor binding molecule, a crosslinking agent, a water soluble vitamin, a lipid soluble vitamin, an RNA/DNA cleaving complex, a metal chelator, a porphyrin, an alkylator, or a polymeric compound selected from polymeric amines, polymeric glycols and polyethers; [and compare] wherein said conjugate optionally includes a linking moiety.

38. (Amended) A compound having one of the following formulas:



wherein:

L is $R^{12}(R^{13})_a$; wherein:

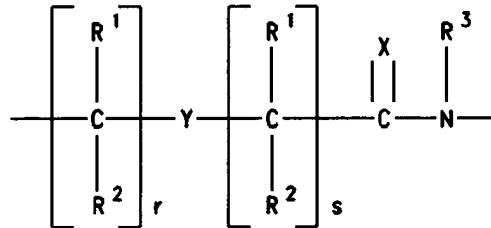
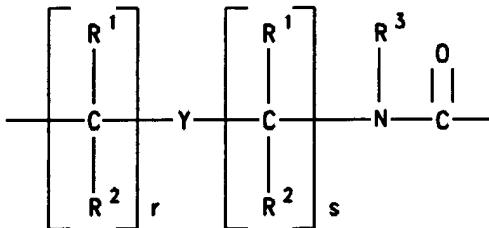
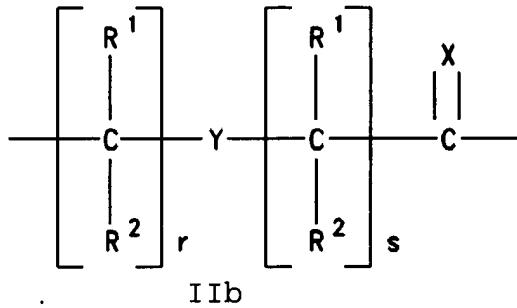
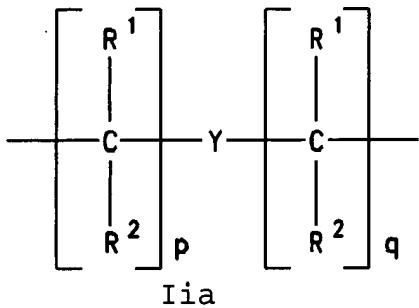
R^{12} is hydrogen, hydroxy, (C_1-C_4) alkanoyl, a naturally occurring nucleobase, a non-naturally occurring nucleobase, an aromatic moiety, a DNA intercalator, a nucleobase-binding group, a heterocyclic moiety, a reporter ligand, or a conjugate and at least one of R^{12} is a naturally occurring nucleobase, a non-naturally occurring nucleobase, a DNA intercalator, or a nucleobase-binding group;

R^{13} is a conjugate; and

a is 0 or 1;

A and B are selected such that:

- (a) A is a group of formula (IIa), (IIb) or (IIc) and B is N or R^3N^+ ; or
- (b) A is a group of formula (IId) and B is CH ;



where:

X is O, S, Se, NR³, CH₂ or C(CH₃)₂;

Y is a single bond, O, S or NR⁴;

p and q independently are zero or an integer from 1 to 5;

r and s independently are zero or an integer from 1 to 5;

R¹ and R² independently are hydrogen, (C₁-C₄)alkyl, hydroxy-substituted (C₁-C₄)alkyl, alkoxy-substituted (C₁-C₄)alkyl, alkylthio-substituted (C₁-C₄)alkyl, hydroxy, alkoxy, alkylthio, amino, halogen or a conjugate;

C is (CR⁶R⁷)_y;

D is (CR⁶R⁷)_z; wherein:

R^6 and R^7 independently are hydrogen, a side chain of a naturally occurring alpha amino acid, (C_2-C_6) alkyl, aryl, aralkyl, heteroaryl, hydroxy, (C_1-C_6) alkoxy, (C_1-C_6) alkylthio, a conjugate, NR^3R^4 and SR^5 or R^6 and R^7 taken together complete an alicyclic or heterocyclic system;

R^3 and R^4 independently are hydrogen, a conjugate, (C_1-C_4) alkyl, hydroxy- or alkoxy- or alkylthio-substituted (C_1-C_4) alkyl, hydroxy, alkoxy, alkylthio or amino; and R^5 is hydrogen, a conjugate, (C_1-C_6) alkyl, hydroxy-, alkoxy-, or alkylthio- substituted (C_1-C_6) alkyl;

each of y and z is zero or an integer from 1 to 10, the sum $y + z$ being greater than 2 but not more than 10;

E independently is $COOH$, $CSOH$, $SOOH$, SO_2OH or an activated or protected derivative thereof;

F independently is NHR^3 or $NPgR^3$, where Pg is an amino protecting group;

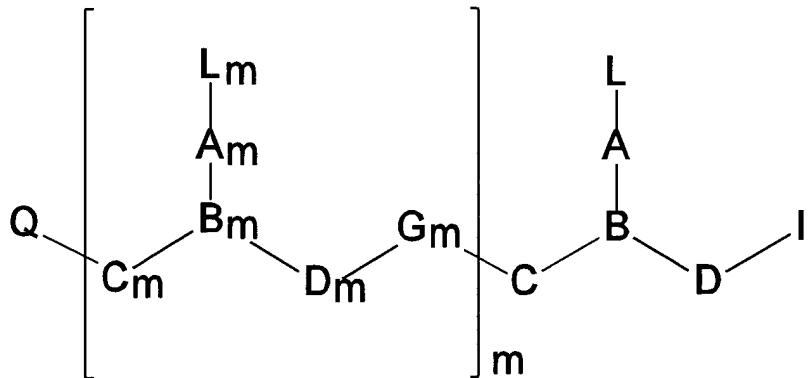
[wherein:] or

F comprises a conjugate selected from a terpene, a cell receptor binding molecule, a crosslinking agent, a water soluble vitamin, a lipid soluble vitamin, a porphyrin, or an alkylator; or

at least one of A and L comprises a conjugate selected from a reporter enzyme, a reporter molecule, a steroid, a carbohydrate, a terpene, a peptide, a protein, a phospholipid, a cell receptor binding molecule, a crosslinking agent, a water soluble vitamin, a lipid soluble vitamin, an RNA/DNA cleaving complex, a metal chelator, a porphyrin, an alkylator, or a polymeric compound selected from polymeric amines, polymeric glycols and polyethers; and wherein said conjugate optionally includes a linking moiety.

Please add new claims 39-49 as indicated below:

--39. A peptide nucleic acid conjugate of the formula:



wherein:

m is an integer from 1 to about 50;

L and L_m independently are $R^{12}(R^{13})_a$ wherein:

R^{12} is hydrogen, hydroxy, (C_1-C_4) alkanoyl, a naturally occurring nucleobase, a non-naturally occurring nucleobase, an aromatic moiety, a DNA intercalator, a nucleobase-binding group, a heterocyclic moiety, a reporter ligand, or a conjugate; provided that at least one of R^{12} is a naturally occurring nucleobase, a non-naturally occurring nucleobase, a DNA intercalator, or a nucleobase-binding group;

R^{13} is a conjugate; and

a is 0 or 1;

C and C_m independently are $(CR^6R^7)_y$; wherein:

R^6 and R^7 independently are hydrogen, a side chain of a naturally occurring alpha amino acid, (C_2-C_6) alkyl, aryl, aralkyl, heteroaryl, hydroxy, (C_1-C_6) alkoxy, (C_1-C_6) alkylthio, a conjugate, NR^3R^4 , SR^5 or R^6 and R^7 taken together complete an alicyclic or heterocyclic system;

wherein R^5 is hydrogen, a conjugate, (C_1-C_6) alkyl, hydroxy-, alkoxy-, or alkylthio- substituted (C_1-C_6) alkyl; and

R^3 and R^4 independently are hydrogen, a conjugate, (C_1-C_4) alkyl, hydroxy- or alkoxy- or alkylthio-

substituted (C_1 - C_4) alkyl, hydroxy, alkoxy,
alkylthio or amino;

D and D_m independently are $(CR^6R^7)_z$;

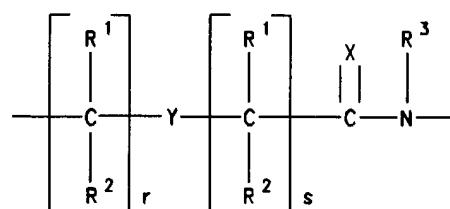
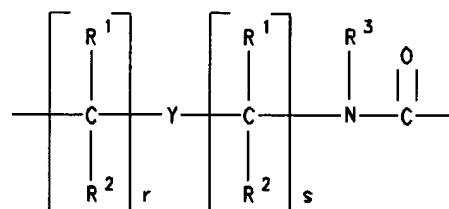
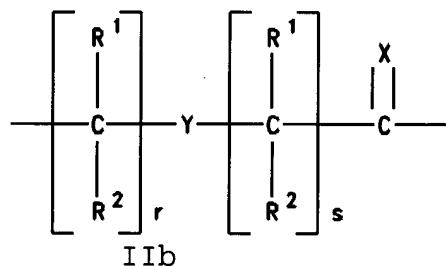
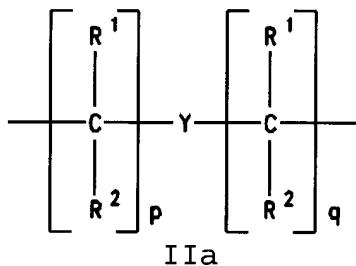
each of y and z is zero or an integer from 1 to 10, wherein
the sum $y + z$ is greater than 2 but not more than 10;

G_m is independently $-NR^3CO-$, $-NR^3CS-$, $-NR^3SO-$, or
 $-NR^3SO_2-$ in either orientation;

each pair of $A-A_m$ and $B-B_m$ are selected such that:

(a) A or A_m is a group of formula (IIa), (IIb) or (IIc) and
 B or B_m is N or R^3N^+ ; or

(b) A or A_m is a group of formula (IID) and B or B_m is CH ;



wherein:

X is O , S , Se , NR^3 , CH_2 or $C(CH_3)_2$;

Y is a single bond, O, S or NR⁴;
each of p and q is zero or an integer from 1 to 5;
each of r and s is zero or an integer from 1 to 5;
R¹ and R² independently are hydrogen, (C₁-C₄)alkyl, hydroxy-
substituted (C₁-C₄)alkyl, alkoxy-substituted (C₁-C₄)alkyl,
alkylthio-substituted (C₁-C₄)alkyl, hydroxy, alkoxy, alkylthio,
amino, halogen or a conjugate;

I is -NR⁸R⁹ or -NR¹⁰C(O)R¹¹; wherein:

R⁸, R⁹, R¹⁰ and R¹¹ independently are hydrogen, alkyl, an
amino protecting group, a reporter ligand, an
intercalator, a chelator, a peptide, a protein, a
carbohydrate, a lipid, a steroid, a nucleoside, a
nucleotide, a nucleotide diphosphate, a nucleotide
triphosphate, an oligonucleotide, an oligonucleoside, a
soluble polymer, a non-soluble polymer or a conjugate;

Q is -CO₂H, -CO₂R⁸, -CO₂R⁹, -CONR⁸R⁹, -SO₃H, -SO₂NR¹⁰R¹¹ or an
activated derivative of -CO₂H or -SO₃H; and

wherein:

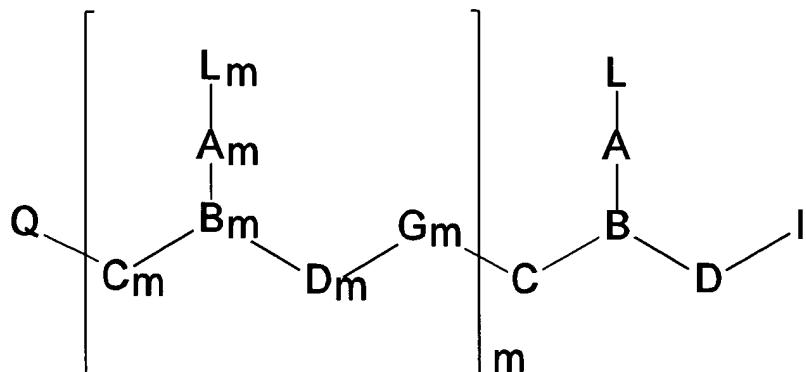
at least one of Q and I comprises a conjugate selected from
a terpene, a cell receptor binding molecule, a crosslinking
agent, a water soluble vitamin, a lipid soluble vitamin, a
porphyrin, or an alkylator; or

at least one of A, A_m, L, and L_m comprises a conjugate selected from a reporter enzyme, a reporter molecule, a steroid, a carbohydrate, a terpene, a peptide, a protein, a phospholipid, a cell receptor binding molecule, a crosslinking agent, a water soluble vitamin, a lipid soluble vitamin, an RNA/DNA cleaving complex, a metal chelator, a porphyrin, an alkylator, or a polymeric compound selected from polymeric amines, polymeric glycols and polyethers;

wherein said conjugate optionally includes a linking moiety; and

wherein at least one of R¹, R² or R³ is a conjugate.

40. A peptide nucleic acid conjugate of the formula:



wherein:

m is an integer from 1 to about 50;

L and L_m independently are R¹²(R¹³)_a wherein:

R^{12} is hydrogen, hydroxy, (C_1-C_4) alkanoyl, a naturally occurring nucleobase, a non-naturally occurring nucleobase, an aromatic moiety, a DNA intercalator, a nucleobase-binding group, a heterocyclic moiety, a reporter ligand, or a conjugate; provided that at least one of R^{12} is a naturally occurring nucleobase, a non-naturally occurring nucleobase, a DNA intercalator, or a nucleobase-binding group;

R^{13} is a conjugate; and

a is 0 or 1;

C and C_m independently are $(CR^6R^7)_y$; wherein:

R^6 and R^7 independently are hydrogen, a side chain of a naturally occurring alpha amino acid, (C_2-C_6) alkyl, aryl, aralkyl, heteroaryl, hydroxy, (C_1-C_6) alkoxy, (C_1-C_6) alkylthio, a conjugate, NR^3R^4 , SR^5 or R^6 and R^7 taken together complete an alicyclic or heterocyclic system;

wherein R^5 is hydrogen, a conjugate, (C_1-C_6) alkyl, hydroxy-, alkoxy-, or alkylthio- substituted (C_1-C_6) alkyl; and

R^3 and R^4 independently are hydrogen, a conjugate, (C_1-C_4) alkyl, hydroxy- or alkoxy- or alkylthio-

substituted (C_1-C_4) alkyl, hydroxy, alkoxy,
alkylthio or amino;

D and D_m independently are $(CR^6R^7)_z$;

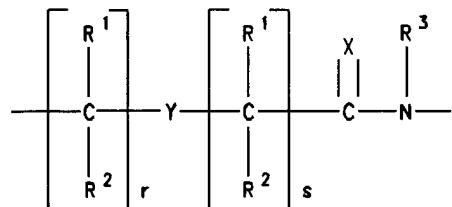
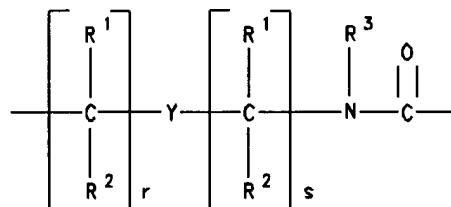
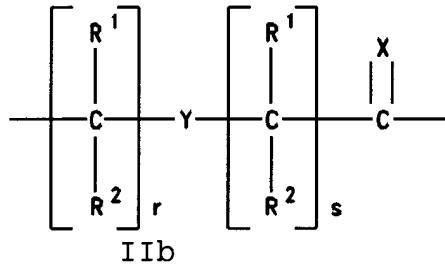
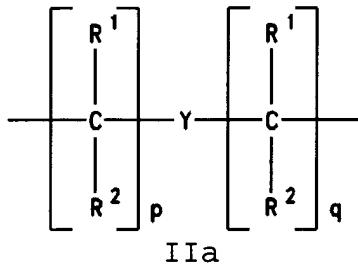
each of y and z is zero or an integer from 1 to 10, wherein
the sum $y + z$ is greater than 2 but not more than 10;

G_m is independently $-NR^3CO-$, $-NR^3CS-$, $-NR^3SO-$, or
 $-NR^3SO_2-$ in either orientation;

each pair of $A-A_m$ and $B-B_m$ are selected such that:

(a) A or A_m is a group of formula (IIa), (IIb) or (IIc) and
 B or B_m is N or R^3N^+ ; or

(b) A or A_m is a group of formula (IID) and B or B_m is CH ;



wherein:

X is O , S , Se , NR^3 , CH_2 or $C(CH_3)_2$;

Y is a single bond, O, S or NR⁴;
each of p and q is zero or an integer from 1 to 5;
each of r and s is zero or an integer from 1 to 5;
R¹ and R² independently are hydrogen, (C₁-C₄)alkyl, hydroxy-
substituted (C₁-C₄)alkyl, alkoxy-substituted (C₁-C₄)alkyl,
alkylthio-substituted (C₁-C₄)alkyl, hydroxy, alkoxy, alkylthio,
amino, halogen or a conjugate;

I is -NR⁶R⁹ or -NR¹⁰C(O)R¹¹; wherein:

R⁸, R⁹, R¹⁰ and R¹¹ independently are hydrogen, alkyl, an
amino protecting group, a reporter ligand, an
intercalator, a chelator, a peptide, a protein, a
carbohydrate, a lipid, a steroid, a nucleoside, a
nucleotide, a nucleotide diphosphate, a nucleotide
triphosphate, an oligonucleotide, an oligonucleoside, a
soluble polymer, a non-soluble polymer or a conjugate;

Q is -CO₂H, -CO₂R⁸, -CO₂R⁹, -CONR⁸R⁹, -SO₃H, -SO₂NR¹⁰R¹¹ or an
activated derivative of -CO₂H or -SO₃H; and

wherein:

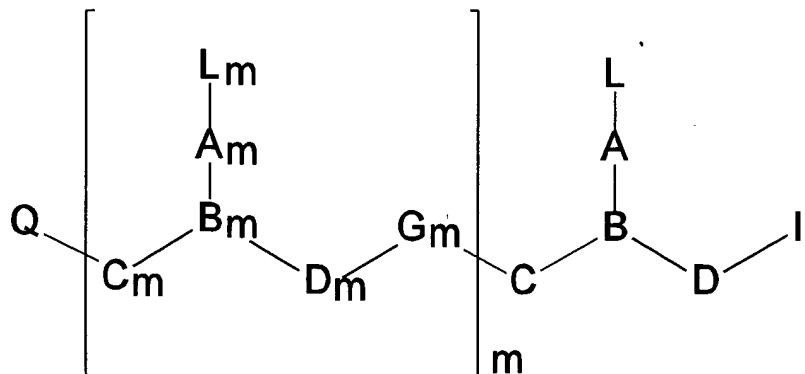
at least one of Q and I comprises a conjugate selected from
a terpene, a cell receptor binding molecule, a crosslinking
agent, a water soluble vitamin, a lipid soluble vitamin, a
porphyrin, or an alkylator; or

at least one of A, A_m, L, and L_m comprises a conjugate selected from a reporter enzyme, a reporter molecule, a steroid, a carbohydrate, a terpene, a peptide, a protein, a phospholipid, a cell receptor binding molecule, a crosslinking agent, a water soluble vitamin, a lipid soluble vitamin, an RNA/DNA cleaving complex, a metal chelator, a porphyrin, an alkylator, or a polymeric compound selected from polymeric amines, polymeric glycols and polyethers;

wherein said conjugate optionally includes a linking moiety; and

wherein at least one of R⁸, R⁹, R¹⁰ and R¹¹ is a conjugate.

41. A peptide nucleic acid conjugate of the formula:



wherein:

m is an integer from 1 to about 50;

L and L_m independently are R¹²(R¹³)_a wherein:

R^{12} is hydrogen, hydroxy, (C_1-C_4) alkanoyl, a naturally occurring nucleobase, a non-naturally occurring nucleobase, an aromatic moiety, a DNA intercalator, a nucleobase-binding group, a heterocyclic moiety, a reporter ligand, or a conjugate; provided that at least one of R^{12} is a naturally occurring nucleobase, a non-naturally occurring nucleobase, a DNA intercalator, or a nucleobase-binding group;

R^{13} is a conjugate; and

a is 0 or 1;

C and C_m independently are $(CR^6R^7)_y$; wherein:

R^6 and R^7 independently are hydrogen, a side chain of a naturally occurring alpha amino acid, (C_2-C_6) alkyl, aryl, aralkyl, heteroaryl, hydroxy, (C_1-C_6) alkoxy, (C_1-C_6) alkylthio, a conjugate, NR^3R^4 , SR^5 or R^6 and R^7 taken together complete an alicyclic or heterocyclic system;

wherein R^5 is hydrogen, a conjugate, (C_1-C_6) alkyl, hydroxy-, alkoxy-, or alkylthio- substituted (C_1-C_6) alkyl; and

R^3 and R^4 independently are hydrogen, a conjugate, (C_1-C_4) alkyl, hydroxy- or alkoxy- or alkylthio-

substituted (C_1-C_4) alkyl, hydroxy, alkoxy,
alkylthio or amino;

D and D_m independently are $(CR^6R^7)_z$;

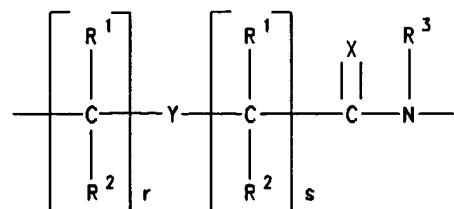
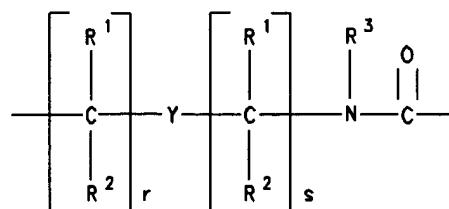
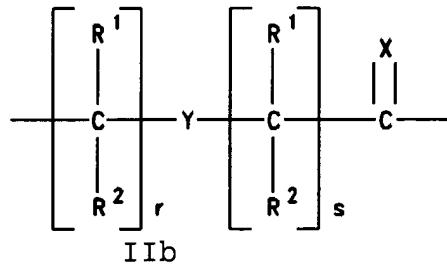
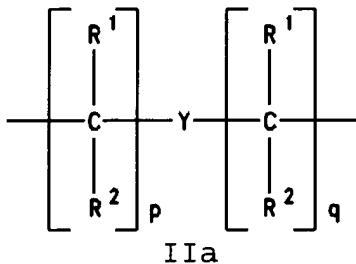
each of y and z is zero or an integer from 1 to 10, wherein
the sum $y + z$ is greater than 2 but not more than 10;

G_m is independently $-NR^3CO-$, $-NR^3CS-$, $-NR^3SO-$, or
 $-NR^3SO_2-$ in either orientation;

each pair of $A-A_m$ and $B-B_m$ are selected such that:

(a) A or A_m is a group of formula (IIa), (IIb) or (IIc) and
 B or B_m is N or R^3N^+ ; or

(b) A or A_m is a group of formula (IID) and B or B_m is CH ;



wherein:

X is O , S , Se , NR^3 , CH_2 or $C(CH_3)_2$;

Y is a single bond, O, S or NR⁴;
each of p and q is zero or an integer from 1 to 5;
each of r and s is zero or an integer from 1 to 5;
R¹ and R² independently are hydrogen, (C₁-C₄)alkyl, hydroxy-
substituted (C₁-C₄)alkyl, alkoxy-substituted (C₁-C₄)alkyl,
alkylthio-substituted (C₁-C₄)alkyl, hydroxy, alkoxy, alkylthio,
amino, halogen or a conjugate;

I is -NR⁶R⁹ or -NR¹⁰C(O)R¹¹; wherein:

R⁸, R⁹, R¹⁰ and R¹¹ independently are hydrogen, alkyl, an
amino protecting group, a reporter ligand, an
intercalator, a chelator, a peptide, a protein, a
carbohydrate, a lipid, a steroid, a nucleoside, a
nucleotide, a nucleotide diphosphate, a nucleotide
triphosphate, an oligonucleotide, an oligonucleoside, a
soluble polymer, a non-soluble polymer or a conjugate;

Q is -CO₂H, -CO₂R⁸, -CO₂R⁹, -CONR⁸R⁹, -SO₃H, -SO₂NR¹⁰R¹¹ or an
activated derivative of -CO₂H or -SO₃H; and

wherein:

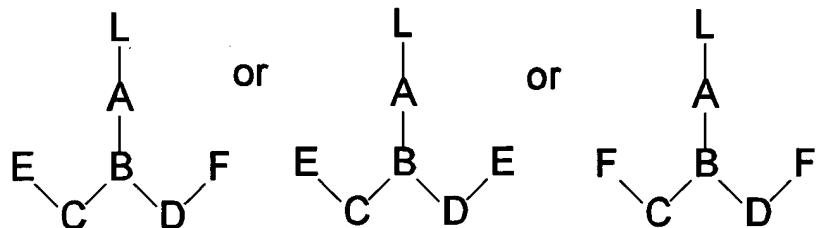
at least one of Q and I comprises a conjugate selected from
a terpene, a cell receptor binding molecule, a crosslinking
agent, a water soluble vitamin, a lipid soluble vitamin, a
porphyrin, or an alkylator; or

at least one of A, A_m, L, and L_m comprises a conjugate selected from a reporter enzyme, a reporter molecule, a steroid, a carbohydrate, a terpene, a peptide, a protein, a phospholipid, a cell receptor binding molecule, a crosslinking agent, a water soluble vitamin, a lipid soluble vitamin, an RNA/DNA cleaving complex, a metal chelator, a porphyrin, an alkylator, or a polymeric compound selected from polymeric amines, polymeric glycols and polyethers;

wherein said conjugate optionally includes a linking moiety; and

wherein at least one of R³ R⁴, R⁵, R⁶ and R⁷ is a conjugate.

42. A peptide nucleic acid conjugate of formula:



wherein:

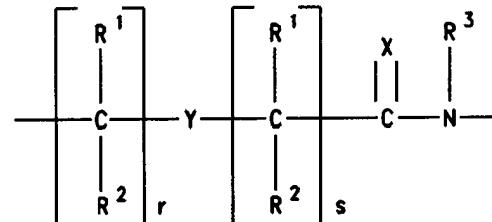
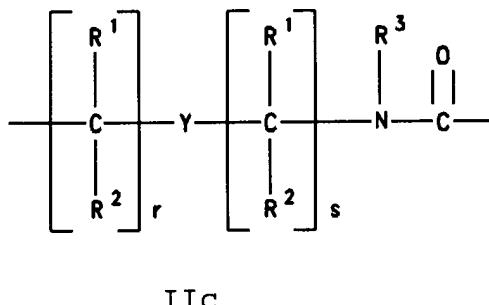
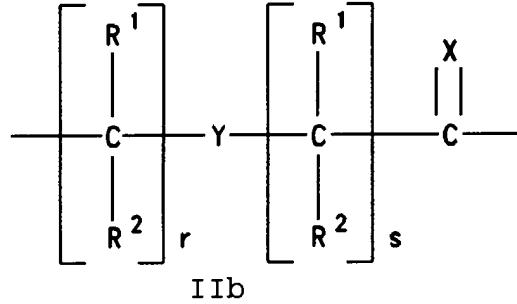
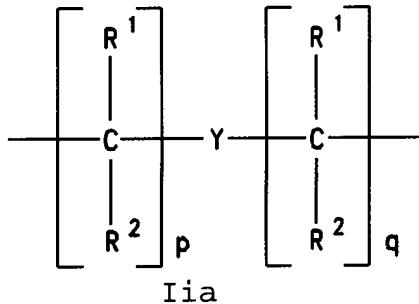
L is R¹² (R¹³)_a; wherein:

R¹² is hydrogen, hydroxy, (C₁-C₄) alkanoyl, a naturally occurring nucleobase, a non-naturally occurring nucleobase, an aromatic moiety, a DNA intercalator, a

nucleobase-binding group, a heterocyclic moiety, a reporter ligand, or a conjugate and at least one of R^{12} is a naturally occurring nucleobase, a non-naturally occurring nucleobase, a DNA intercalator, or a nucleobase-binding group;
 R^{13} is a conjugate; and
 a is 0 or 1;

A and B are selected such that:

- (a) A is a group of formula (IIa), (IIb) or (IIc) and B is N or R^3N^+ ; or
- (b) A is a group of formula (IID) and B is CH ;



where:

X is O, S, Se, NR³, CH₂ or C(CH₃)₂;

Y is a single bond, O, S or NR⁴;

p and q independently are zero or an integer from 1 to 5;

r and s independently are zero or an integer from 1 to 5;

R¹ and R² independently are hydrogen, (C₁-C₄)alkyl, hydroxy-substituted (C₁-C₄)alkyl, alkoxy-substituted (C₁-C₄)alkyl, alkylthio-substituted (C₁-C₄)alkyl, hydroxy, alkoxy, alkylthio, amino, halogen or a conjugate;

C is (CR⁶R⁷)_y;

D is (CR⁶R⁷)_z; wherein:

R⁶ and R⁷ independently are hydrogen, a side chain of a naturally occurring alpha amino acid, (C₂-C₆) alkyl, aryl, aralkyl, heteroaryl, hydroxy, (C₁-C₆) alkoxy, (C₁-C₆) alkylthio, a conjugate, NR³R⁴ and SR⁵ or R⁶ and R⁷ taken together complete an alicyclic or heterocyclic system;

R³ and R⁴ independently are hydrogen, a conjugate, (C₁-C₄)alkyl, hydroxy- or alkoxy- or alkylthio-substituted (C₁-C₄)alkyl, hydroxy, alkoxy, alkylthio or amino; and R⁵ is hydrogen, a conjugate, (C₁-C₆)alkyl, hydroxy-, alkoxy-, or alkylthio- substituted (C₁-C₆)alkyl;

each of y and z is zero or an integer from 1 to 10, the sum

y + z being greater than 2 but not more than 10;

E independently is COOH, CSOH, SOOH, SO₂OH or an activated or protected derivative thereof;

F independently is NHR³ or NPgR³, where Pg is an amino protecting group; or

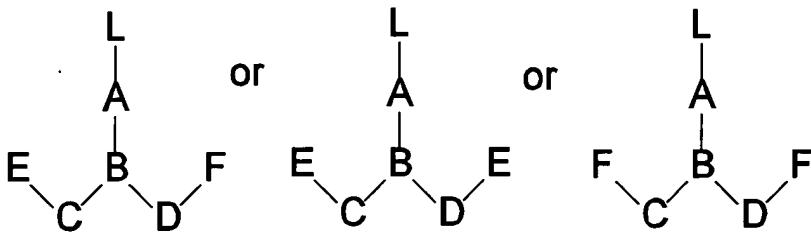
F comprises a conjugate selected from a terpene, a cell receptor binding molecule, a crosslinking agent, a water soluble vitamin, a lipid soluble vitamin, a porphyrin, or an alkylator; or

at least one of A and L comprises a conjugate selected from a reporter enzyme, a reporter molecule, a steroid, a carbohydrate, a terpene, a peptide, a protein, a phospholipid, a cell receptor binding molecule, a crosslinking agent, a water soluble vitamin, a lipid soluble vitamin, an RNA/DNA cleaving complex, a metal chelator, a porphyrin, an alkylator, or a polymeric compound selected from polymeric amines, polymeric glycols and polyethers; and wherein said conjugate optionally includes a linking moiety;

and

wherein at least one group R³ is a conjugate.

43. A peptide nucleic acid conjugate of formula:



wherein:

L is $R^{12}(R^{13})_a$; wherein:

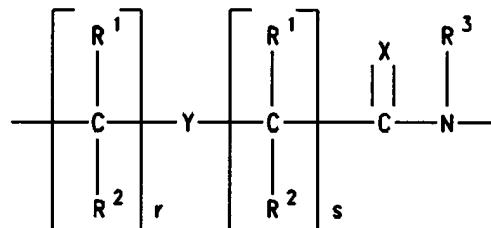
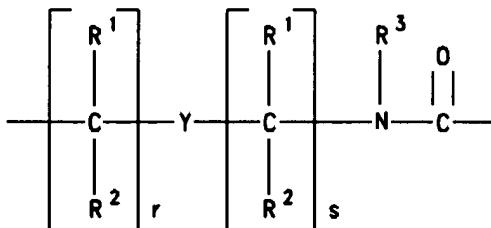
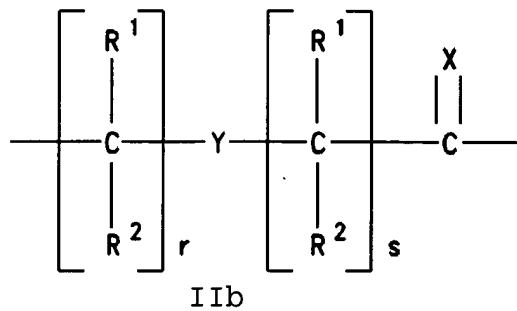
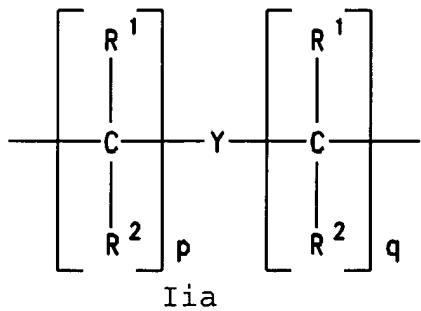
R^{12} is hydrogen, hydroxy, (C_1-C_4) alkanoyl, a naturally occurring nucleobase, a non-naturally occurring nucleobase, an aromatic moiety, a DNA intercalator, a nucleobase-binding group, a heterocyclic moiety, a reporter ligand, or a conjugate and at least one of R^{12} is a naturally occurring nucleobase, a non-naturally occurring nucleobase, a DNA intercalator, or a nucleobase-binding group;

R^{13} is a conjugate; and

a is 0 or 1;

A and B are selected such that:

- (a) A is a group of formula (IIa), (IIb) or (IIc) and B is N or R^3N^+ ; or
- (b) A is a group of formula (IID) and B is CH ;



where:

X is O, S, Se, NR³, CH₂ or C(CH₃)₂;

Y is a single bond, O, S or NR⁴;

p and q independently are zero or an integer from 1 to 5;

r and s independently are zero or an integer from 1 to 5;

R¹ and R² independently are hydrogen, (C₁-C₄)alkyl, hydroxy-substituted (C₁-C₄)alkyl, alkoxy-substituted (C₁-C₄)alkyl, alkylthio-substituted (C₁-C₄)alkyl, hydroxy, alkoxy, alkylthio, amino, halogen or a conjugate;

C is (CR⁶R⁷)_y;

D is (CR⁶R⁷)_z; wherein:

R^6 and R^7 independently are hydrogen, a side chain of a naturally occurring alpha amino acid, (C_2-C_6) alkyl, aryl, aralkyl, heteroaryl, hydroxy, (C_1-C_6) alkoxy, (C_1-C_6) alkylthio, a conjugate, NR^3R^4 and SR^5 or R^6 and R^7 taken together complete an alicyclic or heterocyclic system;

R^3 and R^4 independently are hydrogen, a conjugate, (C_1-C_4) alkyl, hydroxy- or alkoxy- or alkylthio-substituted (C_1-C_4) alkyl, hydroxy, alkoxy, alkylthio or amino; and R^5 is hydrogen, a conjugate, (C_1-C_6) alkyl, hydroxy-, alkoxy-, or alkylthio- substituted (C_1-C_6) alkyl;

each of y and z is zero or an integer from 1 to 10, the sum $y + z$ being greater than 2 but not more than 10;

E independently is $COOH$, $CSOH$, $SOOH$, SO_2OH or an activated or protected derivative thereof;

F independently is NHR^3 or $NPgR^3$, where Pg is an amino protecting group; or

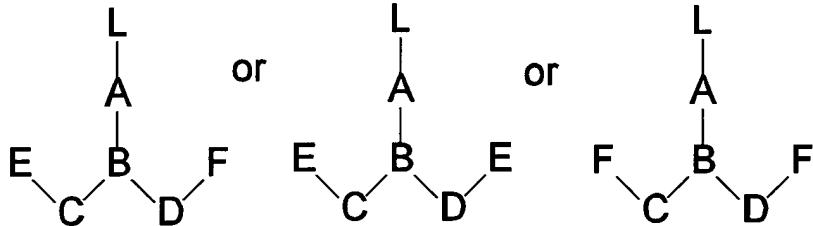
F comprises a conjugate selected from a terpene, a cell receptor binding molecule, a crosslinking agent, a water soluble vitamin, a lipid soluble vitamin, a porphyrin, or an alkylator; or

at least one of A and L comprises a conjugate selected from a reporter enzyme, a reporter molecule, a steroid, a

carbohydrate, a terpene, a peptide, a protein, a phospholipid, a cell receptor binding molecule, a crosslinking agent, a water soluble vitamin, a lipid soluble vitamin, an RNA/DNA cleaving complex, a metal chelator, a porphyrin, an alkylator, or a polymeric compound selected from polymeric amines, polymeric glycols and polyethers; and wherein said conjugate optionally includes a linking moiety; and

wherein at least one of said groups A or said groups B include a conjugate.

44. A peptide nucleic acid conjugate of formula:



wherein:

L is $R^{12}(R^{13})_a$; wherein:

R^{12} is hydrogen, hydroxy, (C_1-C_4) alkanoyl, a naturally occurring nucleobase, a non-naturally occurring nucleobase, an aromatic moiety, a DNA intercalator, a nucleobase-binding group, a heterocyclic moiety, a

reporter ligand, or a conjugate and at least one of R¹² is a naturally occurring nucleobase, a non-naturally occurring nucleobase, a DNA intercalator, or a nucleobase-binding group;

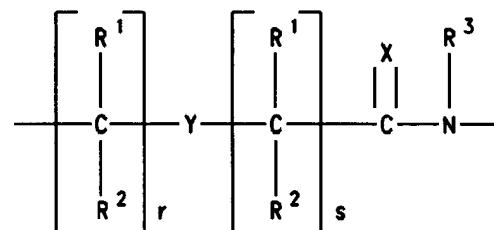
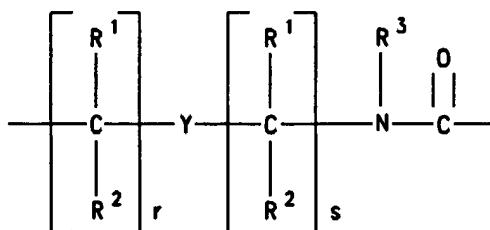
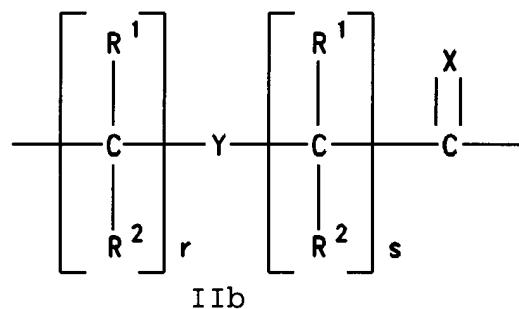
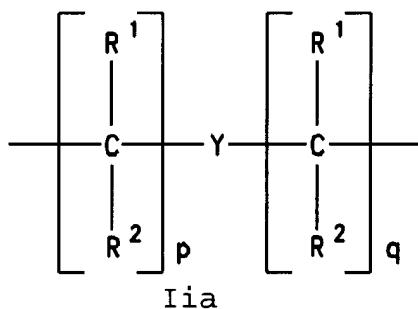
R¹³ is a conjugate; and

a is 0 or 1;

A and B are selected such that:

(a) A is a group of formula (IIa), (IIb) or (IIc) and B is N or R³N⁺; or

(b) A is a group of formula (IID) and B is CH;



where:

X is O, S, Se, NR³, CH₂ or C(CH₃)₂;

Y is a single bond, O, S or NR⁴;
p and q independently are zero or an integer from 1 to 5;
r and s independently are zero or an integer from 1 to 5;
R¹ and R² independently are hydrogen, (C₁-C₄)alkyl, hydroxy-
substituted (C₁-C₄)alkyl, alkoxy-substituted (C₁-C₄)alkyl,
alkylthio-substituted (C₁-C₄)alkyl, hydroxy, alkoxy, alkylthio,
amino, halogen or a conjugate;

C is (CR⁶R⁷)_y;

D is (CR⁶R⁷)_z; wherein:

R⁶ and R⁷ independently are hydrogen, a side chain of a
naturally occurring alpha amino acid, (C₂-C₆) alkyl,
aryl, aralkyl, heteroaryl, hydroxy, (C₁-C₆) alkoxy, (C₁-
C₆) alkylthio, a conjugate, NR³R⁴ and SR⁵ or R⁶ and R⁷
taken together complete an alicyclic or heterocyclic
system;

R³ and R⁴ independently are hydrogen, a conjugate, (C₁-
C₄)alkyl, hydroxy- or alkoxy- or alkylthio-substituted
(C₁-C₄)alkyl, hydroxy, alkoxy, alkylthio or amino; and
R⁵ is hydrogen, a conjugate, (C₁-C₆)alkyl, hydroxy-,
alkoxy-, or alkylthio- substituted (C₁-C₆)alkyl;

each of y and z is zero or an integer from 1 to 10, the sum
y + z being greater than 2 but not more than 10;

E independently is COOH, CSOH, SOOH, SO₂OH or an activated or protected derivative thereof;

F independently is NHR³ or NPgR³, where Pg is an amino protecting group; or

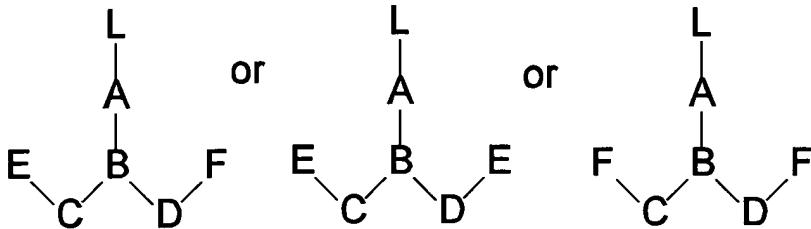
F comprises a conjugate selected from a terpene, a cell receptor binding molecule, a crosslinking agent, a water soluble vitamin, a lipid soluble vitamin, a porphyrin, or an alkylator; or

at least one of A and L comprises a conjugate selected from a reporter enzyme, a reporter molecule, a steroid, a carbohydrate, a terpene, a peptide, a protein, a phospholipid, a cell receptor binding molecule, a crosslinking agent, a water soluble vitamin, a lipid soluble vitamin, an RNA/DNA cleaving complex, a metal chelator, a porphyrin, an alkylator, or a polymeric compound selected from polymeric amines, polymeric glycols and polyethers; and wherein said conjugate optionally includes a linking moiety;

and

wherein at least one of group R¹ or group R² is a conjugate.

45. A peptide nucleic acid conjugate of formula:



wherein:

L is $R^{12}(R^{13})_a$; wherein:

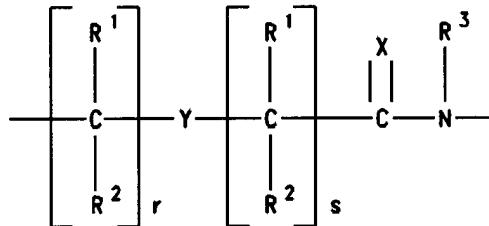
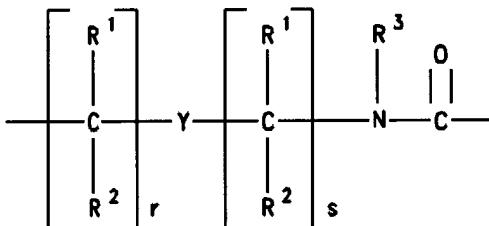
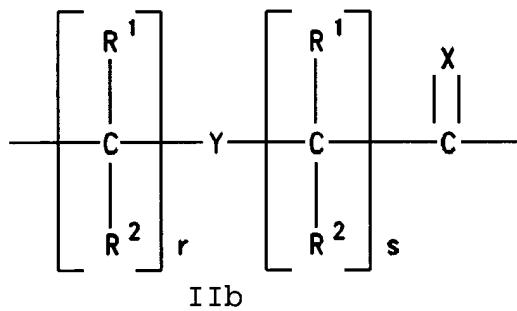
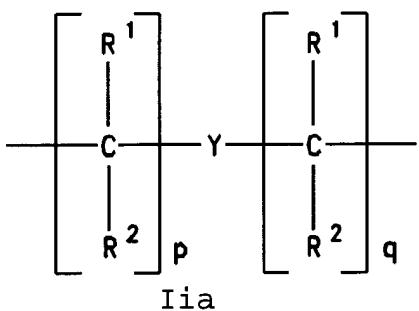
R^{12} is hydrogen, hydroxy, (C_1-C_4) alkanoyl, a naturally occurring nucleobase, a non-naturally occurring nucleobase, an aromatic moiety, a DNA intercalator, a nucleobase-binding group, a heterocyclic moiety, a reporter ligand, or a conjugate and at least one of R^{12} is a naturally occurring nucleobase, a non-naturally occurring nucleobase, a DNA intercalator, or a nucleobase-binding group;

R^{13} is a conjugate; and

a is 0 or 1;

A and B are selected such that:

- (a) A is a group of formula (IIa), (IIb) or (IIc) and B is N or R^3N^+ ; or
- (b) A is a group of formula (IID) and B is CH;



where:

X is O, S, Se, NR³, CH₂ or C(CH₃)₂;

Y is a single bond, O, S or NR⁴;

p and q independently are zero or an integer from 1 to 5;

r and s independently are zero or an integer from 1 to 5;

R¹ and R² independently are hydrogen, (C₁-C₄)alkyl, hydroxy-substituted (C₁-C₄)alkyl, alkoxy-substituted (C₁-C₄)alkyl, alkylthio-substituted (C₁-C₄)alkyl, hydroxy, alkoxy, alkylthio, amino, halogen or a conjugate;

C is (CR⁶R⁷)_y;

D is (CR⁶R⁷)_z; wherein:

R^6 and R^7 independently are hydrogen, a side chain of a naturally occurring alpha amino acid, (C_2-C_6) alkyl, aryl, aralkyl, heteroaryl, hydroxy, (C_1-C_6) alkoxy, (C_1-C_6) alkylthio, a conjugate, NR^3R^4 and SR^5 or R^6 and R^7 taken together complete an alicyclic or heterocyclic system;

R^3 and R^4 independently are hydrogen, a conjugate, (C_1-C_4) alkyl, hydroxy- or alkoxy- or alkylthio-substituted (C_1-C_4) alkyl, hydroxy, alkoxy, alkylthio or amino; and R^5 is hydrogen, a conjugate, (C_1-C_6) alkyl, hydroxy-, alkoxy-, or alkylthio- substituted (C_1-C_6) alkyl; each of y and z is zero or an integer from 1 to 10, the sum $y + z$ being greater than 2 but not more than 10;

E independently is $COOH$, $CSOH$, $SOOH$, SO_2OH or an activated or protected derivative thereof;

F independently is NHR^3 or $NPgR^3$, where Pg is an amino protecting group; or

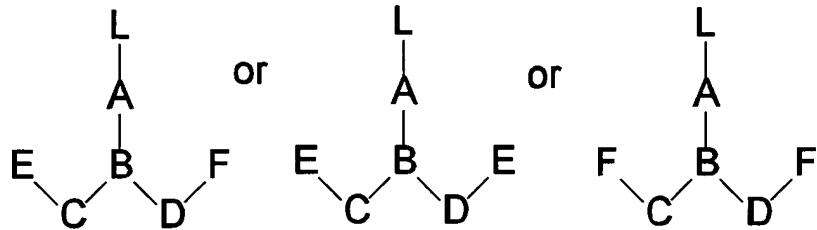
F comprises a conjugate selected from a terpene, a cell receptor binding molecule, a crosslinking agent, a water soluble vitamin, a lipid soluble vitamin, a porphyrin, or an alkylator; or

at least one of A and L comprises a conjugate selected from a reporter enzyme, a reporter molecule, a steroid, a

carbohydrate, a terpene, a peptide, a protein, a phospholipid, a cell receptor binding molecule, a crosslinking agent, a water soluble vitamin, a lipid soluble vitamin, an RNA/DNA cleaving complex, a metal chelator, a porphyrin, an alkylator, or a polymeric compound selected from polymeric amines, polymeric glycols and polyethers; and wherein said conjugate optionally includes a linking moiety; and

wherein at least one of R^3 , R^4 , R^5 , R^6 , and R^7 is a conjugate.

46. A peptide nucleic acid conjugate of formula:



wherein:

L is $R^{12}(R^{13})_a$; wherein:

R^{12} is hydrogen, hydroxy, (C_1-C_4) alkanoyl, a naturally occurring nucleobase, a non-naturally occurring nucleobase, an aromatic moiety, a DNA intercalator, a nucleobase-binding group, a heterocyclic moiety, a reporter ligand, or a conjugate and at least one of R^{12}

is a naturally occurring nucleobase, a non-naturally occurring nucleobase, a DNA intercalator, or a nucleobase-binding group;

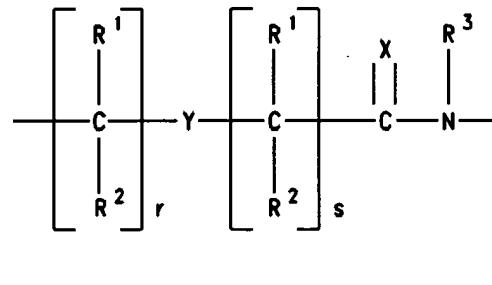
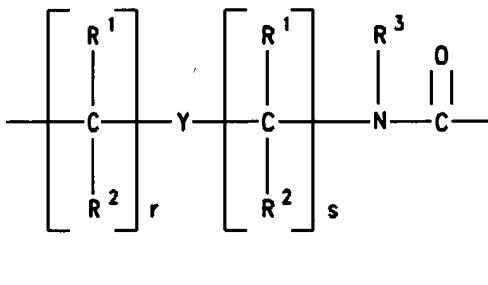
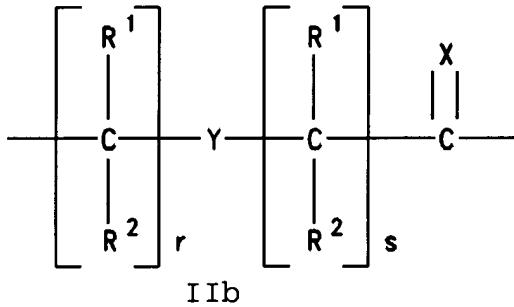
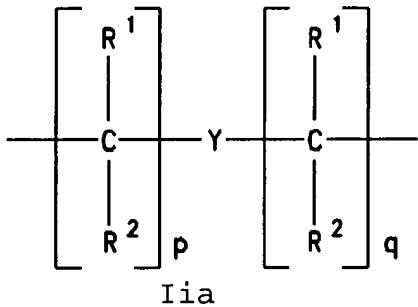
R^{13} is a conjugate; and

a is 0 or 1;

A and B are selected such that:

(a) A is a group of formula (IIa), (IIb) or (IIc) and B is N or R^3N^+ ; or

(b) A is a group of formula (IId) and B is CH ;



where:

X is O , S , Se , NR^3 , CH_2 or $C(CH_3)_2$;

Y is a single bond, O , S or NR^4 ;

p and q independently are zero or an integer from 1 to 5;
r and s independently are zero or an integer from 1 to 5;
R¹ and R² independently are hydrogen, (C₁-C₄)alkyl, hydroxy-substituted (C₁-C₄)alkyl, alkoxy-substituted (C₁-C₄)alkyl, alkylthio-substituted (C₁-C₄)alkyl, hydroxy, alkoxy, alkylthio, amino, halogen or a conjugate;

C is (CR⁶R⁷)_y;

D is (CR⁶R⁷)_z; wherein:

R⁶ and R⁷ independently are hydrogen, a side chain of a naturally occurring alpha amino acid, (C₂-C₆) alkyl, aryl, aralkyl, heteroaryl, hydroxy, (C₁-C₆) alkoxy, (C₁-C₆) alkylthio, a conjugate, NR³R⁴ and SR⁵ or R⁶ and R⁷ taken together complete an alicyclic or heterocyclic system;

R³ and R⁴ independently are hydrogen, a conjugate, (C₁-C₄)alkyl, hydroxy- or alkoxy- or alkylthio-substituted (C₁-C₄)alkyl, hydroxy, alkoxy, alkylthio or amino; and R⁵ is hydrogen, a conjugate, (C₁-C₆)alkyl, hydroxy-, alkoxy-, or alkylthio- substituted (C₁-C₆)alkyl;

each of y and z is zero or an integer from 1 to 10, the sum y + z being greater than 2 but not more than 10;

E independently is COOH, CSOH, SOOH, SO₂OH or an activated or protected derivative thereof;

F independently is NHR³ or NPgR³, where Pg is an amino protecting group; or

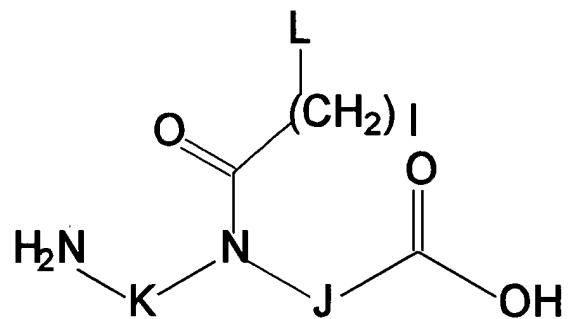
F comprises a conjugate selected from a terpene, a cell receptor binding molecule, a crosslinking agent, a water soluble vitamin, a lipid soluble vitamin, a porphyrin, or an alkylator; or

at least one of A and L comprises a conjugate selected from a reporter enzyme, a reporter molecule, a steroid, a carbohydrate, a terpene, a peptide, a protein, a phospholipid, a cell receptor binding molecule, a crosslinking agent, a water soluble vitamin, a lipid soluble vitamin, an RNA/DNA cleaving complex, a metal chelator, a porphyrin, an alkylator, or a polymeric compound selected from polymeric amines, polymeric glycols and polyethers; and wherein said conjugate optionally includes a linking moiety;

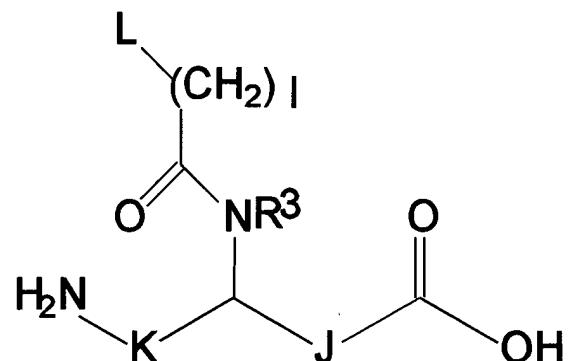
and

wherein at least one of said groups C or said groups D include a conjugate.

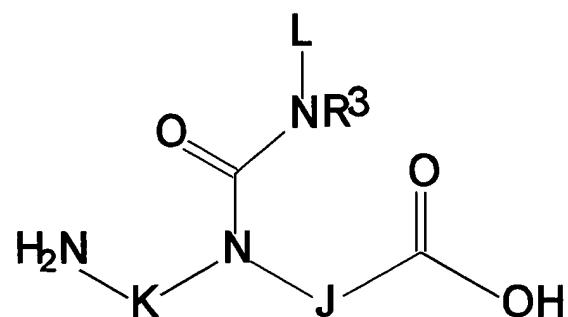
47. A peptide nucleic acid conjugate comprising a plurality of PNA monomers wherein at least one of said PNA monomers has the formula:



or formula:



or formula:



wherein:

L is $R^{12}(R^{13})_a$; wherein:

R^{12} is hydrogen, hydroxy, (C_1-C_4) alkanoyl, a naturally occurring nucleobase, a non-naturally occurring nucleobase, an aromatic moiety, a DNA intercalator, a nucleobase-binding group, a heterocyclic moiety, a reporter ligand, or a conjugate and at least one of R^{12} is a naturally occurring nucleobase, a non-naturally occurring nucleobase, a DNA intercalator, or a nucleobase-binding group;

R^{13} is a conjugate; and

a is 0 or 1;

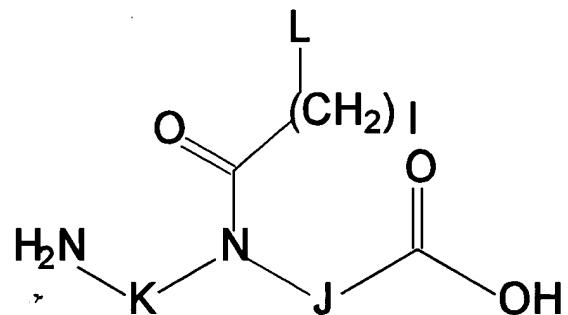
K is $(CR^6R^7)_z$;

J is $(CR^6R^7)_y$; wherein:

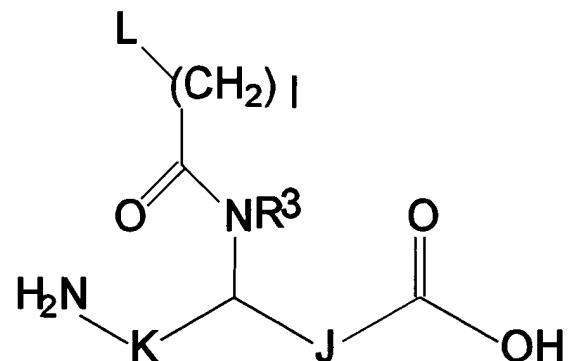
R^6 and R^7 are independently hydrogen, a side chain of a naturally occurring alpha amino acid, (C_2-C_6) alkyl, aryl, aralkyl, heteroaryl, hydroxy, (C_1-C_6) alkoxy, (C_1-C_6) alkylthio, a conjugate, NR^3R^4 and SR^5 or R^6 and R^7 taken together complete an alicyclic or heterocyclic system;

R^3 and R^4 independently are hydrogen, a conjugate, (C_1-C_4)alkyl, hydroxy- or alkoxy- or alkylthio-substituted (C_1-C_4)alkyl, hydroxy, alkoxy, alkylthio or amino; R^5 is hydrogen, a conjugate, (C_1-C_6)alkyl, hydroxy-, alkoxy-, or alkylthio- substituted (C_1-C_6)alkyl; each of y and z is zero or an integer from 1 to 10, the sum $y + z$ being greater than 2 but not more than 10; l is an integer from 1 to 5; and at least one of L and $R3$ comprises a conjugate selected from a reporter enzyme, a reporter molecule, a steroid, a carbohydrate, a terpene, a peptide, a protein, a phospholipid, a cell receptor binding molecule, a crosslinking agent, a water soluble vitamin, a lipid soluble vitamin, an RNA/DNA cleaving complex, a metal chelator, a porphyrin, an alkylator, or a polymeric compound selected from polymeric amines, polymeric glycols and polyethers; wherein said conjugate optionally includes a linking moiety; and wherein at least one of R^3 , R^4 , R^5 , R^6 , and R^7 is a conjugate.

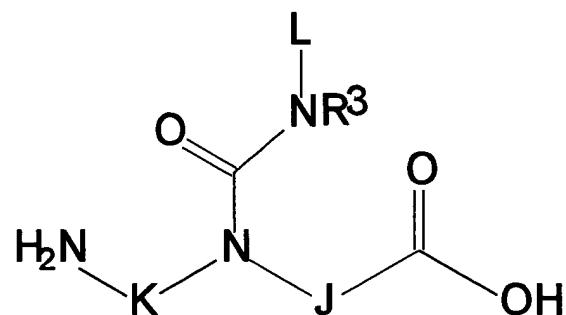
48. A peptide nucleic acid conjugate comprising a plurality of PNA monomers wherein at least one of said PNA monomers has the formula:



or formula:



or formula:



wherein:

L is $R^{12}(R^{13})_a$; wherein:

R^{12} is hydrogen, hydroxy, (C_1-C_4) alkanoyl, a naturally occurring nucleobase, a non-naturally occurring nucleobase, an aromatic moiety, a DNA intercalator, a nucleobase-binding group, a heterocyclic moiety, a reporter ligand, or a conjugate and at least one of R^{12} is a naturally occurring nucleobase, a non-naturally occurring nucleobase, a DNA intercalator, or a nucleobase-binding group;

R^{13} is a conjugate; and

a is 0 or 1;

K is $(CR^6R^7)_z$;

J is $(CR^6R^7)_y$; wherein:

R^6 and R^7 are independently hydrogen, a side chain of a naturally occurring alpha amino acid, (C_2-C_6) alkyl, aryl, aralkyl, heteroaryl, hydroxy, (C_1-C_6) alkoxy, (C_1-C_6) alkylthio, a conjugate, NR^3R^4 and SR^5 or R^6 and R^7 taken together complete an alicyclic or heterocyclic system;

R^3 and R^4 independently are hydrogen, a conjugate, (C_1-C_4) alkyl, hydroxy- or alkoxy- or alkylthio-substituted (C_1-C_4) alkyl, hydroxy, alkoxy, alkylthio or amino;

R^5 is hydrogen, a conjugate, (C_1-C_6) alkyl, hydroxy-, alkoxy-, or alkylthio- substituted (C_1-C_6) alkyl; each of y and z is zero or an integer from 1 to 10, the sum $y + z$ being greater than 2 but not more than 10;

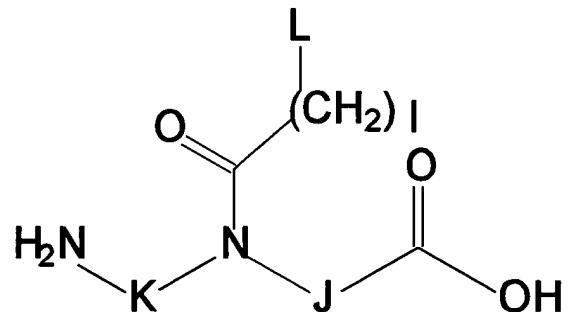
l is an integer from 1 to 5; and

at least one of L and R^3 comprises a conjugate selected from a reporter enzyme, a reporter molecule, a steroid, a carbohydrate, a terpene, a peptide, a protein, a phospholipid, a cell receptor binding molecule, a crosslinking agent, a water soluble vitamin, a lipid soluble vitamin, an RNA/DNA cleaving complex, a metal chelator, a porphyrin, an alkylator, or a polymeric compound selected from polymeric amines, polymeric glycols and polyethers;

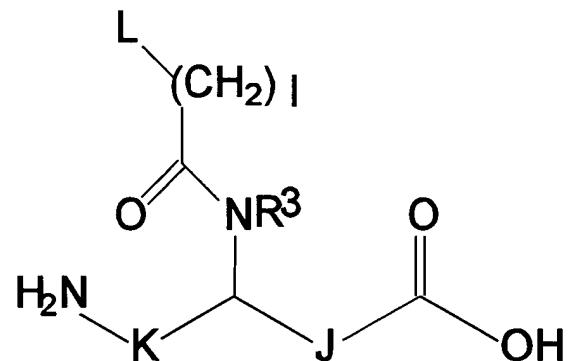
wherein said conjugate optionally includes a linking moiety; and

wherein at least one of said group K or said group J includes a conjugate.

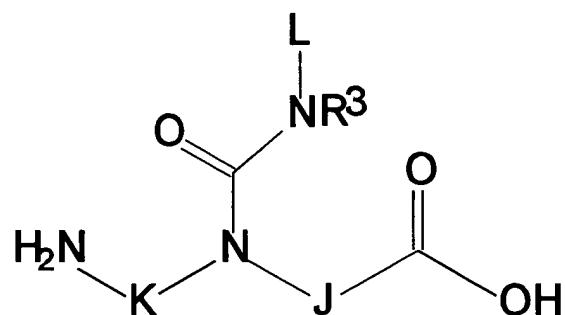
49. A peptide nucleic acid conjugate comprising a plurality of PNA monomers wherein at least one of said PNA monomers has the formula:



or formula:



or formula:



wherein:

L is $R^{12}(R^{13})_a$; wherein:

R^{12} is hydrogen, hydroxy, (C_1-C_4) alkanoyl, a naturally occurring nucleobase, a non-naturally occurring nucleobase, an aromatic moiety, a DNA intercalator, a nucleobase-binding group, a heterocyclic moiety, a reporter ligand, or a conjugate and at least one of R^{12} is a naturally occurring nucleobase, a non-naturally occurring nucleobase, a DNA intercalator, or a nucleobase-binding group;

R^{13} is a conjugate; and

a is 0 or 1;

K is $(CR^6R^7)_z$;

J is $(CR^6R^7)_y$; wherein:

R^6 and R^7 are independently hydrogen, a side chain of a naturally occurring alpha amino acid, (C_2-C_6) alkyl, aryl, aralkyl, heteroaryl, hydroxy, (C_1-C_6) alkoxy, (C_1-C_6) alkylthio, a conjugate, NR^3R^4 and SR^5 or R^6 and R^7 taken together complete an alicyclic or heterocyclic system;

R^3 and R^4 independently are hydrogen, a conjugate, (C_1-C_4) alkyl, hydroxy- or alkoxy- or alkylthio-substituted (C_1-C_4) alkyl, hydroxy, alkoxy, alkylthio or amino;

R^5 is hydrogen, a conjugate, (C_1 - C_6)alkyl, hydroxy-, alkoxy-, or alkylthio- substituted (C_1 - C_6)alkyl; each of y and z is zero or an integer from 1 to 10, the sum y + z being greater than 2 but not more than 10;

l is an integer from 1 to 5; and

at least one of L and R3 comprises a conjugate selected from a reporter enzyme, a reporter molecule, a steroid, a carbohydrate, a terpene, a peptide, a protein, a phospholipid, a cell receptor binding molecule, a crosslinking agent, a water soluble vitamin, a lipid soluble vitamin, an RNA/DNA cleaving complex, a metal chelator, a porphyrin, an alkylator, or a polymeric compound selected from polymeric amines, polymeric glycols and polyethers;

wherein said conjugate optionally includes a linking moiety; and

wherein said group R^3 is a conjugate.--

REMARKS

After entry of the proposed amendment, claims 1, 5, 8-10, 12, 13, 15, 18-20, 22-24, 30-33, and 37-49 will be pending in this patent application.

Applicants have amended the specification to insert the pages containing a sequence listing to comply with the Sequence